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말기신부전 환자에서 혈청 N-Terminal Pro-B-type Natriuretic Peptide 상승과 관련된 체수분 상태 및 좌심실 이상소견의 상대적 기여도

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Relative Contribution of Volume Status and Left Ventricular Abnormalities to Elevated Serum N-Terminal Pro-B-type Natriuretic Peptide Level in Incident Dialysis Patients

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Background: N-terminal pro-B type natriuretic peptide (NT-pro-BNP) may be a useful biomarker predicting adverse cardiovascular events. However, the relative contribution of volume status, left ventricular (LV) mass, LV systolic and diastolic dysfunction to elevated circulating NT-pro-BNP level has insufficiently evaluated in end-stage renal disease (ESRD) patients.

Methods: A total of 203 patients who commenced maintenance dialysis therapy (2009-2012) and had measurement for serum NT-pro-BNP, were analyzed. Multivariable linear regression model was constructed with age, sex, diabetes, mean arterial pressure (MAP), extracellular water/body weight estimated by bioimpedence analysis (ECW/Wt), ejection fraction (EF), the ratio of early mitral flow velocity to early mitral annulus velocity (E/e'), LV mass index (LVMI), hemoglobin and log C-reactive protein (CRP) as independent variables, and log NT-pro-BNP as dependent variable. Standardized beta coefficient was used to compare the relative contribution of independent variables to NT-pro-BNP level.

Results: Patients were 56.1±14.8 years old, 48.3% women, and 54.2% diabetics. Median NT-pro-BNP level was 3630 pg/mL (interquartile range: 960-13731 pg/mL). All of MAP, ECW/Wt, EF, E/e' and LVMI were significantly correlated with log NT-pro-BNP level in univariate analysis. In multivariable analysis, standardized beta coefficients were -0.303 for EF ($p<0.001$), 0.269 for ECW/Wt ($p<0.001$), 0.219 for E/e' ($p<0.001$) and 0.154 for LVMI ($p=0.008$) in order (Table).

Conclusion: NT-pro-BNP level is influenced by multiple factors including LV structural or functional abnormality as well as volume status in ESRD patients. Although this complexity makes a difficulty in interpretation, NP-pro-BNP may serve as a useful adjunct method to identify cardiac abnormalities and/or volume overload in ESRD patients.

Key Words: 말기신부전, 생화학지표, 체수분 Natriuretic peptide, Renal failure, Volume

Table. Summary of Multivariable Regression Model for Log NT-pro-BNP Level

	Coefficient	Std error	Beta	p-value
Age (yr)	0.003	0.003	0.058	0.285
Male	-0.114	0.087	-0.068	0.193
Diabetes	-0.011	0.090	-0.007	0.899
MAP (mmHg)	0.006	0.004	0.089	0.102
ECW/Wt	6.605	1.318	0.269	<0.001
EF (%)	-0.030	0.006	-0.303	<0.001
E/e'	0.037	0.010	0.219	<0.001
LVMI (g/m^2)	0.004	0.001	0.154	0.008
Hemoglobin (g/dL)	-0.616	0.025	-0.126	0.015
Log CRP (log mg/dL)	0.208	0.051	0.218	<0.001
Constant	2.902	0.667	-	<0.001